ENVIRONMENTAL RESTORATION DEPARTMENT

FIELD TEAM LEADER'S DAILY LOG

DATE START 7/11, 19 95

DATE END 8/22, 19 95

LOGBOOK NO: ERP-056-95

LOGBOOK ASSIGNED TO: Chris Hiaring

SITE: OU 5-02/12

WHEN COMPLETED RETURN TO:

[redacted]
DONNA KIRCHNER (6-9873)
MS 3910

FIELD TEAM LEADER'S DAILY LOGBOOK

7/26/95 0900 - D. Gianotto, P. Boyd, H. Bullock, L. Gurney, and K. Roberts arrive at CF-625 and prepare equipment for PBF-30 septic tank sampling. Trip blank is prepared. 1000 - Team arrives at PBF-30 and stage site. L. Gurney gives health + safety briefing with emphasis on biological hazard and good sanitary practices, H_2S hazards, and work conditions. L. Gurney authorizes no hard hat requirement because there are no overhead hazards. Samples will be surveyed before leaving PBF area and personnel through a portal monitor. Travis Rybicki, Keith Barnes, George Reynolds arrive at site as observers. Lance breifs them on the hazards. The cover is removed at 1030. The peristaltic pump does not work. We use the dipper for water samples. The VOC samples are collected first. Times are 1049 and 1050. The water is murky, but not dark. The next sample is gamma spec at 1057. The wind makes paperwork and sampling difficult. Water samples are collected from different vertical + horizontal stratas of the tank. The CLP metals is collected at 1100. Three 2360ml Amber glass will be used to collect the 6000ml required for CLP Semi VOA/PCBs. at 1107. Mike Crane arrives to take photos. Gross α/β collected at ~~###~~ 1117. The TCLP Volatile collected at 1121. We move on to collect the field blanks. Gross α/β blanks collected at 1130. CLP metals blank collected at 1133. The gamma

spec blank is collected a 1135. VOC blanks collected at 1138. We will collect sludge samples after lunch. 1145 — DFG

We decide to blow-off lunch and continue sampling. The sludge is collected with the dipper. Water is decanted off the dipper and put into a metal pan. Some is black colored, some is brown colored. The sludge in the pan is thoroughly mixed in the pan. The sludge is runny, not thick. It's pourable. No VOCs or H_2S has been detected by the industrial hygenist. The first sludge sample is gross alpha beta collected at 1202. The γ-spec is collected at 1204. The TCLP Volatile is collected at 1206. The CLP metals is collected at 1208. The CLP semi-VOA/PCB is collected at 1210. The CLP VOA is collected at 1212. Sampling equipment is decontamined with soap and water. 1220 1230 - RCT surveys all the samples and sampling equipment. No radiation is detected. All samples and equipment are released. 1330 - Samples are brought to CF-625 for preservation and preparations for shipping. 1500 - Samples are ready for shipping. We put them at 4°C and will ship tomorrow. — DFG

DFG
7/26/95

FIELD TEAM LEADER'S DAILY LOGBOOK

7/27/95. D. Gianotto & P. Boyd package and ship samples to RML, Barringer, & Roy Weston for analysis 1300. DG

DG

7/31/95 - RML results for PBF-26 are recieved. See communication from J.A. Daley to D.F. Gianotti (JAD-99-95). Low levels of Cs-137 are detected. (0.7 - 4.7 pCi/gm). DFG

Talked with Bob Sutherland concerning ~~to~~ the surveying of sample location. We plan on doing this next week. Chris Hiaring recieved some preliminary results from Huntindon for PCBs, which indicated all samples were < 10 ppm for PCB.

D-C

FIELD TEAM LEADER'S DAILY LOGBOOK

8/15/95 L. Wilson, D. Grady + B. Sutherland meet at PBF Gaurd Gate 1305. We Arrive at PBF 30 1315 to locate Surveying points. D. Grady + B. Sutherland with measurements can Survey with bully barn over Sample point. 1330 arrive at Sperti II L. Wilson, D Grady + B. Sutherland Stake all verification Samples points. A total of 5 Samples. 1345 Arrive back to guard gate. Discuss getting work permit for PBF will finish Survey at a later date when all paperwork is Completed.

LAW 15 AUG 95

FIELD TEAM LEADER'S DAILY LOGBOOK

8/22/95 L. Wilson and D. Mignotto meet with Bob Sutherland at 1400 8/22/95 CEA-633. discuss Surveying at PBF-30 and Spent IV. Waiting to get Final Surveys to turn into Mark Galuska.

LAW 8/24/95

Lockheed
Idaho Technologies Company

INTERDEPARTMENTAL COMMUNICATION

Date: September 15, 1995

To: C. M. Hiaring MS 3953 6-2719

From: R. P. Wells MS 3910 6-4561

Subject: TRANSMITTAL OF THE LIMITATIONS AND VALIDATION (L&V) REPORT, POWER BURST FACILITY-30 SEPTIC TANKS, RADIOCHEMICAL ANALYSIS, SAMPLE DELIVERY GROUP #PTK00401AB - RPW-260-95

Attached is the L&V report for the radiochemical analysis of two water samples and one solid sample collected at the Idaho National Engineering Laboratory (INEL). The samples were collected in support of the Power Burst Facility-30 Septic Tank investigation conducted by the Lockheed Idaho Technologies Company, Environmental Operations Branch. A copy of the validated data is also attached.

The data package was reviewed by the INEL Sample Management Office (SMO) for validation of the sample results data. The validation was performed using SMO Standard Operating Procedure (SOP) 12.1.2, "Standard Operating Procedure for Radiological Data Validation." The data were validated at method validation level "A," as described in technical procedure, TPR-79, "Levels of Analytical Method Data Validation." All analysis results reported in this data package meet the requirements of analytical support level four for radiological analysis.

Should you have any questions about these data or the L&V report, please contact me at 526-4561 or OfficeVision ID WR1.

RPW

Attachments

cc: R. J. Bargelt, (w/o Attach), MS 3910
D. Jones, MS 3910
C. S. Watkins (w/o Attach), MS 3910
ARDC Files, MS 3922
File Code 438

DATA LIMITATIONS AND VALIDATION REPORT

FOR LOCKHEED IDAHO TECHNOLOGIES COMPANY

IDAHO NATIONAL ENGINEERING LABORATORY

POWER BURST FACILITY-30

SEPTIC TANKS

SAMPLE DELIVERY GROUP #PTK00401AB

RADIOCHEMICAL ANALYSIS

INTRODUCTION

Two water samples and one solid sample were collected to provide characterization data in support of the Power Burst Facility-30 Septic Tank investigation at the Idaho National Engineering Laboratory (INEL). The investigation is being conducted by the Lockheed Idaho Technologies Company Environmental Operations Branch at the INEL. The samples were collected on July 26, 1995 and analyzed by Barringer Laboratories Inc. located in Golden, CO. The samples were analyzed for gross alpha (GRA) and gross beta (GRB). Sample results are collectively identified as Sample Delivery Group (SDG) PTK00401AB. The sample results table provides a cross reference of the laboratory sample number to the INEL sample number.

DATA EVALUATION AND LABORATORY PERFORMANCE

1. DATA PACKAGE COMPLETENESS

The Barringer data package was complete and comprehensive.

2. INSTRUMENT CALIBRATIONS

All detector calibrations are shown to be in control at the time of sample analysis.

3. LABORATORY CONTROL SAMPLES

The purpose of the Laboratory Control Sample (LCS) is to demonstrate the recovery of the analyte(s) of interest throughout the analytical process. If the LCS is within the acceptance range of 100 $\pm$ 15%, it is considered to be in control. If the LCS is outside of this range but within the range of 100 $\pm$ 20%, the LCS is considered to be questionable. If the LCS recovery is outside this range, the LCS is considered to be out-of-control.

A LCS was analyzed for each matrix type. The GRA and GRB LCS recoveries for water sample analysis are 102% and 94%, respectively. For solid sample analysis, the GRA and GRB LCS recoveries are 99% and 94%, respectively. The LCS recoveries are in control.

4. BLANK SAMPLES

The purpose of the blank sample is to demonstrate that the analytical method used does not contribute to the activity of the analyte(s) of interest. If the blank is less than one-half the contractual detection limit (CDL), it is considered to be in control. If the blank is greater than one-half the CDL but less than the CDL, it is considered to be questionable. If the blank is greater than the CDL, it is considered to be out-of-control.

A blank was analyzed for each matrix type. The blanks for GRA and GRB analyses of both matrix types are in control.

5. DUPLICATE SAMPLES

Duplicates are evaluated by calculation of a mean difference value. This mean difference value is calculated using the original sample result, the duplicate result, and their associated errors. A mean difference of 1.5 or less indicates a 95% confidence level that the two values are statistically equal. A mean difference of greater than 1.5, but less than 2.0, indicates a 90% confidence level that the two values are statistically equal and the duplicate is considered to be questionable. If the mean difference is greater than 2.0, the two values are considered not to be statistically equal and the duplicate is considered to be out-of-control.

A duplicate was analyzed for each matrix type. For the GRA analysis of water samples, neither the sample nor its duplicate contained any detectable activity at the 95% confidence level and provided no information. For the GRA analysis of solid samples, the calculated mean difference is 0.23, which is in control.

For the GRB analysis of water samples, neither the sample nor its duplicate contained any detectable activity at the 95% confidence level and provided no information. For the GRB analysis of solid samples, the calculated mean difference is 0.21, which is in control.

6. ANALYTICAL YIELDS

Neither GRA nor GRB analyses use an analytical yield in the calculation of results.

7. INTERCOMPARISON SAMPLE RESULTS

Intercomparison sample results were available in the Sample Management Office (SMO) from the Department of Energy Environmental Measurements Laboratory Quality Assessment Program (QAP) for the GRA and GRB analyses of water samples and the Environmental Protection Agency Environmental Monitoring Systems Laboratory Performance Evaluation Studies Program for the GRA dnd GRB analyses of water samples. The laboratory demonstrates acceptable accuracy and precision for these analyses. An intercomparison sample program does not exist for the GRA and GRB analyses of solid samples.

8. BLIND QUALITY CONTROL SAMPLES

No blind quality control samples were submitted with this SDG.

9. OTHER QUALITY CONTROL PARAMETERS

One problem was noted during review of the laboratory data package.

(a) The SDG number is incorrectly transcribed on each page of the report as TK00401AB. The SMO protocol requires the lowest sample number, taking into account both alpha and numeric characters, to be the SDG number. The correct SDG number should be PTK00401AB.

This correction will be annotated on the laboratory report forms prior to entry into the Integrated Environmental Data Management System. All other applicable quality control parameters are considered to be in control. Refer to the Quality Control Data Assessment Summary Table for tabulation of the validation parameters.

QUALITY CONTROL DATA ASSESSMENT SUMMARY

	WATER SAMPLES		SOLID SAMPLES	
VALIDATION PARAMETERS	GRA	GRB	GRA	GRB
1. Data Package Completeness	I	I	I	I
2. Instrument Calibrations	I	I	I	I
3. Laboratory Control Samples	I	I	I	I
4. Blank Samples	I	I	I	I
5. Duplicate Samples	N	N	I	I
6. Analytical Yields	N	N	N	N
7. Intercomparison Sample Results	I	I	N	N
8. Blind Quality Control Samples	N	N	N	N
9. Other Quality Control Parameters	I	I	I	I

I = In Control

N = Not Applicable

DATA SUMMARY

The Data Qualifier Flag Summary Table indicates the data qualifier flags assigned to the sample results. Sample results that are statistical nondetects at the 95% confidence level receive a "U" flag. Results that are above the detection limit and meet the criteria for statistically positive values at the 95% confidence limit receive no flag. Results that are associated with a questionable quality control parameter may receive a "J" flag (see details below). Results that are associated with an out-of-control quality control parameter may receive a "J" or "R" flag, depending upon the severity of the violation (see details below).

There were two water samples and one soil sample analyzed for GRA and GRB activity. There were six results reported for this SDG.

SDG #PTK00401AB

GRA results:

The GRA results for one water sample and the one solid sample are statistically positive values at the 95% confidence level. These results receive no flags. The GRA result for the one other water sample is flagged "U" as a statistical nondetect at the 95% confidence level.

GRB results:

The GRB results for one water sample and the one solid sample are statistically positive values at the 95% confidence level. These results receive no flags. The GRB result for the one other water sample is flagged "U" as a statistical nondetect at the 95% confidence level.

DATA QUALIFIER FLAG SUMMARY TABLE

SDG Number: PTK00401AB

SAMPLE NUMBER	GRA	GRB
PTK00401AB		
PTK00701AB	U	U
PTK00501AB		

BLANK = No data qualifier flags are assigned to this sample for this analyte. The result is a statistically positive value at the 95% confidence level.

U = The result is a statistical nondetect at the 95% confidence level.

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Ms. Donna R. Kirchner
LITCO
P.O. Box 1625 ERP ARDC
Idaho Falls, ID 83415-3904

Date: 08/26/95

Lab Name : BARNGR
Analysis : alpha
Test Name: GRA
Job : 952842E
SDG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 4
Rec. Date: 07/28/95
Method : Total

SAMPLE NUMBERS

Field Sample No.	Lab Sample ID No.	Sample Date	Field Sample No.	Lab Sample ID No.	Sample Date
PTK00401AB	9528421	07/26/95	PTK00701AB	9528422	07/26/95

Comments:
Gross Alpha

Release of the data contained in this data package has been authorized by the laboratory manager or the manager's designee, as verified by the following:

Signature: _____ Name: Michael Howard
Title: Laboratory Manager Date: 8-28-95

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. Donna R. Kirchner
TCO
O. Box 1625 ERP ARDC
aho Falls, ID 83415-3904

Date: 08/28/95

b Name : BARNGR
alysis : alpha
st Name: GRA
b : 952842E
G No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 4
Rec. Date: 07/28/95
Method : Total

ient ID	Lab ID	Matrix	Result Error	Units	Analysis Date	Sample Size	Yield	Detect ID
'K00401AB	9528421	NWATER	1.6±0.7	pCi/L	08/18/95	0.2100	105.4	H2
'K00701AB	9528422	NWATER	0.2±0.4	pCi/L	08/18/95	0.2100	105.4	H3

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Idaho Falls, ID 83415-3904

Date: 08/26/95

Lab Name : BARNGR
Analysis : alpha
Test Name: GRA
Job : 952842E
SDG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 4
Rec. Date: 07/28/95
Method : Total

QC Sample ID	Matrix	Analysis Type	Sample Result Err	Known Result Err	Units	LCS Yield	Analysis Date	Chem Detect Yield	ID
PTK00701AB-D	OTHER	DUP	0.2±0.4	NANA	pCi/L	NA	08/18/95	105.4	H4
Blank	OTHER	BLK	0.3±0.3	NANA	pCi/L	NA	08/18/95	105.4	H3
LCS	OTHER	LCS	98±2	96NA	pCi/L	102	08/16/95	105.4	G1

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aho Falls, ID 83415-3904

Date: 08/26/95

Page: 4

b Name : BARNGR
alysis : beta
st Name: GRB
b : 952842E
G No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 4
Rec. Date: 07/28/95
Method : Total

SAMPLE NUMBERS

Field mple No.	Lab Sample ID No.	Sample Date	Field Sample No.	Lab Sample ID No.	Sample Date
TK00401AB	9528421	07/26/95	PTK00701AB	9528422	07/26/95

mments:
ross Beta

elease of the data contained in this data package has been authorized by the aboratory manager or the manager's designee, as verified by the following:

gnature: _____ Name: Michael Howard
tle: Laboratory Manager Date: 8-28-95

BARRINGER LABORATORIES INC.
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Date: 08/26/95

Lab Name : BARNGR
Analysis : beta
Test Name: GRB
Job : 952842E
SDG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 4
Rec. Date: 07/28/95
Method : Total

Client ID	Lab ID	Matrix	Result Error	Units	Analysis Date	Sample Size	Yield	Detect ID
PTK00401AB	9528421	NWATER	6.0±1.1	pCi/L	08/18/95	0.2100	100.0	H2
PTK00701AB	9528422	NWATER	0.9±1.0	pCi/L	08/18/95	0.2100	100.0	H3

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daho Falls, ID 83415-3904

Date: 08/26/95

ab Name : BARNGR
nalysis : beta
est Name: GRB
ob : 952842E
OG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 4
Rec. Date: 07/28/95
Method : Total

Sample ID	Matrix	Analysis Type	Sample Result Err	Known Result Err	Units	LCS Yield	Analysis Date	Chem Yield	Detect ID
TK00701AB-D	OTHER	DUP	0.0±0.9	NANA	pCi/L	NA	08/18/95	100.0	H4
Lank	OTHER	BLK	0.4±0.2	NANA	pCi/L	NA	08/18/95	100.0	H3
CS	OTHER	LCS	89±1	95NA	pCi/L	94	08/16/95	100.0	G1

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Date: 08/26/95

Lab Name : BARNGR
Analysis : alpha
Test Name: GRA
Job : 952842E
SDG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 10
Rec. Date: 07/28/95
Method : Total

SAMPLE NUMBERS

Field Sample No.	Lab Sample ID No.	Sample Date	Field Sample No.	Lab Sample ID No.	Sample Date
PTK00501AB	9528423	07/26/95			

Comments:
Gross Alpha

Release of the data contained in this data package has been authorized by the laboratory manager or the manager's designee, as verified by the following:

Signature: Michael Howard
Title: Laboratory Manager

Name: Michael Howard
Date: 8-28-95

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daho Falls, ID 83415-3904

Date: 08/26/95

ab Name : BARNGR
nalysis : alpha
est Name: GRA
ob : 952842E
DG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 10
Rec. Date: 07/28/95
Method : Total

lient ID	Lab ID	Matrix	Result	Error	Units	Analysis Date	Sample Size	Yield	Detect ID
TK00501AB	9528423	OTHER	6.3	±1.7	pCi/g	08/18/95	0.0807	103.6	G4

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Date: 08/26/95

Lab Name : BARNGR
Analysis : alpha
Test Name: GRA
Job : 952842E
SDG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 10
Rec. Date: 07/28/95
Method : Total

QC Sample ID	Matrix	Analysis Type	Sample Result Err	Known Result Err	Units	LCS Yield	Analysis Date	Chem Detect Yield	ID
PTK00501AB-D	OTHER	DUP	7.5±2.0	NANA	pCi/g	NA	08/18/95	103.6	H1
Blank	OTHER	BLK	0.2±0.2	NANA	pCi/g	NA	08/18/95	103.6	G3
LCS	OTHER	LCS	95±2	96NA	pCi/g	99	08/18/95	103.6	H3

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ab Name : BARNGR
nalysis : beta
est Name: GRB
ob : 952842E
DG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 10
Rec. Date: 07/28/95
Method : Total

SAMPLE NUMBERS

Field ample No.	Lab Sample ID No.	Sample Date	Field Sample No.	Lab Sample ID No.	Sample Date
TK00501AB	9528423	07/26/95			

omments:
ross Beta

elease of the data contained in this data package has been authorized by the aboratory manager or the manager's designee, as verified by the following:

ignature: Michael Howard
itle: Laboratory Manager

Name: Michael Howard
Date: 8-28-95

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Date: 08/26/95

Lab Name : BARNGR
Analysis : beta
Test Name: GRB
Job : 952842E
SDG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 10
Rec. Date: 07/28/95
Method : Total

Client ID	Lab ID	Matrix	Result Error	Units	Analysis Date	Sample Size	Yield	Detect ID
PTK00501AB	9528423	OTHER	20±3	pCi/g	08/18/95	0.0807	100.0	G4

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Date: 08/26/95

Page: 12

ab Name : BARNGR
alysis : beta
est Name: GRB
ob : 952842E
OG No. : TK00401AB

Case No. : ERP94
Analy Mth: 900.0
Detec Lmt: 10
Rec. Date: 07/28/95
Method : Total

Sample ID	Matrix	Analysis Type	Sample Result Err	Known Result Err	Units	LCS Yield	Analysis Date	Chem Yield	Detect ID
TK00501AB-D	OTHER	DUP	18±3	NANA	pCi/g	NA	08/18/95	100.0	H1
ank	OTHER	BLK	0.5±0.2	NANA	pCi/g	NA	08/18/95	100.0	G3
CS	OTHER	LCS	89±1	95NA	pCi/g	94	08/18/95	100.0	H3

NOTEGRAM

Date: November 14, 1995

To: Rulon Nielsen

From: D.E. Burns

Subject: TRACK-1 CALCULATIONS FOR PBF-30

References:

a) DOE, 1994, *Track 2 Sites: Guidance for Assessing Low Probability Hazard Sites at INEL*, Revision 6, DOE/ID-10389, January 1994.

b) Rood, A. S., 1994a, *GWSCREEN: A Semi-Analytical Model for the Assessment of the Groundwater Pathway from Surface or Buried Contamination: Version 2.0, Theory and User's Manual*, EGG-GEO-10797, June 1994.

Attached are tables showing the results of the risk-based soil concentration calculations, and the estimated leach field contaminant concentrations for PBF-30. All of the contaminants shown on the PBF-30 contaminant worksheet you gave me were evaluated in this analysis.

The risk-based concentrations shown in Table 1 were calculated by rearranging the risk equations presented in reference b to solve for soil concentrations that would produce a risk equal to 1E-06 or a hazard quotient equal to 1.0. The concentrations shown are the minimum concentrations calculated from analysis of five exposure routes (soil ingestion, inhalation of fugitive dust, inhalation of volatiles, ingestion of groundwater, and external radiation exposure) in both an occupational and residential scenario. All parameter values used in these calculations are consistent with the EPA standard default values described in reference a.

The groundwater ingestion risk-based concentrations were calculated with the use of the computer model GWSCREEN (reference b). For the purposes of GWSCREEN modeling, I assumed that the contaminants contained in the PBF-30 storage tank would have contaminated a volume of 10 ft x 10 ft x 10 ft (3.05 m x 3.05 m x 3.05 m), and that the depth to groundwater beneath the storage tank is 139 m. These assumptions are consistent with other Track-1 studies performed at PBF.

As shown in the second column of Table 1, risk-based soil concentrations could not be calculated for all of the contaminants that were detected in the storage tank's sludge. For example, six contaminants (aluminum, calcium, iron, magnesium, potassium, and sodium) are essential nutrients that are considered non-toxic to humans. Four other contaminants (2,4-Dichlorobenzene, cobalt, copper, and vanadium), are currently under review by the EPA, so they do not have the toxicity information needed to calculate risk-based concentrations.

The estimated leach field contaminant concentrations are shown in the fourth column of Table 1. These concentrations were estimated assuming the leach field has a surface area of 1,000 ft^2, contaminants contained in the septic system water were deposited in the top 3 ft of soil after infiltrating into the leach field, a total of 40,000,000 gal of water flushed through the septic system over the 8 years that the system was in use, and the concentrations of contaminants that traveled through the septic system were the same as the maximum concentrations measured during the recent sampling of the septic storage tank water. With these assumptions, the following equation was used to estimate the leach field contaminant concentrations;

$$C_{soil} = C_{water} \times CF$$

where;

C_{soil} = Contaminant soil concentration (mg/kg)

C_{water} = Contaminant water concentration (μg/L)

CF = Conversion factor given by;

$$CF = \frac{4E+07\ gal \times 3.79\ L/gal \times 0.001\ mg/\mu g}{3{,}000\ ft^3 \times (0.305\ m/ft)^3 \times (100\ cm/m)^3 \times 1.5\ g/cm^3 \times 0.001\ kg/g}$$

$$CF = 1.19\ \frac{L - mg}{\mu g - kg}$$

Tables 2 and 3 show the exposure route specific risk-based soil concentrations for an occupational and residential exposure scenario. The concentrations shown in the second column of Table 1 are the minimum concentrations from Tables 2 and 3 for each contaminant.

If you have any questions about these results, please call me at 6-4324.

Table 1. Risk-based soil concentrations for PBF-30.

Contaminant	Risk-Based Soil Concentration (mg/kg or pCi/g)	Maximum Measured Septic System Water Concentration (μg/L or pCi/L)	Estimated Leach Field Concentrations (mg/kg or pCi/g)
Semi-volatiles:			
2,4-Dichlorophenol	NC[a]	Not Detected[c]	Not Calculated
1,4-Dichlorobenzene	1.91E+05	1.50E+05	1.79E+05
Volatiles:			
Methylene Chloride	7.55E+01	4.00E+00	4.76E+00
2 - Butanone	1.36E+05	1.80E+01	2.14E+01
Metals:			
Aluminum	NC[b]	2.79E+03	3.32E+03
Arsenic	4.27E-01	4.90E+00	5.83E+00
Barium	1.89E+04	6.19E+01	7.37E+01
Beryllium	1.49E-01	4.50E-01	5.36E-01
Calcium	NC[b]	1.39E+04	1.65E+04
Chromium	1.35E+03	9.96E+01	1.19E+02
Cobalt	NC[a]	2.06E+01	2.45E+01
Copper	NC[a]	9.45E+01	1.12E+02
Iron	NC[b]	1.42E+05	1.69E+05
Lead	9.53E+04	2.54E+02	3.02E+02
Magnesium	NC[b]	1.93E+03	2.30E+03
Manganese	1.35E+03	6.20E+02	7.38E+02
Nickel	5.40E+03	5.33E+01	6.34E+01

Table 1. Risk-based soil concentrations for PBF-30.

Contaminant	Risk-Based Soil Concentration (mg/kg or pCi/g)	Maximum Measured Septic System Water Concentration (μg/L or pCi/L)	Estimated Leach Field Concentrations (mg/kg or pCi/g)
Potassium	NC[b]	9.86E+02	1.17E+03
Silver	1.35E+03	8.43E+02	1.00E+03
Sodium	NC[b]	2.44E+03	2.90E+03
Vanadium	NC[a]	1.88E+01	2.24E+01
Zinc	8.10E+04	2.81E+02	3.34E+02
PCBs:			
Aroclor 1260	8.31E-02	Not Measured[c]	Not Calculated
Radionuclides:			
Cs-137	8.61E-02	Not Measured[c]	Not Calculated

a. Not calculated due to a lack of available toxicity information.
b. Not calculated because contaminant is an essential nutrient.
c. Contaminant was not detected during site sampling.

Table 2. Occupational exposure scenario risk-based soil concentrations.

	Occupational Scenario											
	Soil Ingestion			Inhalation of Dust			Inhalation of Volatiles		Groundwater Ingestion			External Exposure
Contaminant	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at HQ=1	SC at risk=1E-06	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at 1E-06 radionuclides
1,4-Dichlorobenzene	NA	NA	NA	7.77E+10	NA	NA	2.40E+05	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	1.20E+06	NA	NA	2.77E+10	NA	NA	1.71E+05	NA	NA	NA	NA	NA
Arsenic	6.00E+02	3.80E+00	NA	NA	1.85E+04	NA	NA	NA	NA	NA	NA	NA
Barium	1.40E+05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	1.00E+04	1.33E+00	NA	NA	3.31E+04	NA	NA	NA	NA	NA	NA	NA
Chromium	1.00E+04	NA	NA	NA	6.61E+03	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	1.00E+04	NA	NA	4.86E+06	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	1.20E+05	7.60E+02	NA	NA	1.69E+08	NA	NA	1.18E+02	NA	NA	NA	NA
Nickel	4.00E+04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB	1.40E+02	7.40E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1.00E+04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	6.00E+05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cs-137	NA	NA	1.01E+02	NA	NA	3.63E+04	NA	NA	NA	NA	NA	8.61E-02

Table 2. Residential exposure scenario risk-based soil concentrations.

	Residential Scenario												
	Soil Ingestion			Inhalation of Dust			Inhalation of Volatiles		Groundwater Ingestion			External Exposure	Min SC
Contaminant	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at HQ=1	SC at risk=1E-06	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at 1E-06 radionuclides	SC (mg/kg or pCi/g))
1,4-Dichlorobenzene	NA	NA	NA	5.64E+10	NA	NA	1.91E+05	NA	NA	NA	NA	NA	1.91E+05
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	1.62E+05	NA	NA	2.01E+10	NA	NA	1.36E+05	NA	2.54E+05	NA	NA	NA	1.36E+05
Arsenic	8.10E+01	4.27E-01	NA	NA	1.08E+04	NA	NA	NA	5.29E+02	2.75E+00	NA	NA	4.27E-01
Barium	1.89E+04	NA	NA	NA	NA	NA	NA	NA	2.26E+06	NA	NA	NA	1.89E+04
Beryllium	1.35E+03	1.49E-01	NA	NA	1.94E+04	NA	NA	NA	7.80E+05	8.47E+01	NA	NA	1.49E-01
Chromium	1.35E+03	NA	NA	NA	3.87E+03	NA	NA	NA	4.52E+03	NA	NA	NA	1.35E+03
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	9.53E+04	NA	NA	NA	9.53E+04
Manganese	1.35E+03	NA	NA	3.52E+06	NA	NA	NA	NA	1.61E+05	NA	NA	NA	1.35E+03
Methylene Chloride	1.62E+04	8.53E+01	NA	NA	9.88E+07	NA	NA	7.55E+01	2.54E+04	1.32E+02	NA	NA	7.55E+01
Nickel	5.40E+03	NA	NA	NA	NA	NA	NA	NA	1.27E+06	NA	NA	NA	5.40E+03
PCB	1.89E+01	8.31E-02	NA	NA	NA	NA	NA	NA	5.65E+03	2.44E+01	NA	NA	8.31E-02
Silver	1.35E+03	NA	NA	NA	NA	NA	NA	NA	2.88E+05	NA	NA	NA	1.35E+03
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	8.10E+04	NA	NA	NA	NA	NA	NA	NA	2.68E+06	NA	NA	NA	8.10E+04
Cs-137	NA	NA	2.50E+01	NA	NA	2.18E+04	NA	NA	NA	NA	9.34E+219	1.67E-02	8.61E-02

NOTEGRAM

Date: November 14, 1995

To: Rulon Nielsen

From: D.E. Burns

Subject: TRACK-1 CALCULATIONS FOR PBF-30

References:

a) DOE, 1994, *Track 2 Sites: Guidance for Assessing Low Probability Hazard Sites at INEL*, Revision 6, DOE/ID-10389, January 1994.

b) Rood, A. S., 1994a, *GWSCREEN: A Semi-Analytical Model for the Assessment of the Groundwater Pathway from Surface or Buried Contamination: Version 2.0, Theory and User's Manual*, EGG-GEO-10797, June 1994.

Attached are tables showing the results of the risk-based soil concentration calculations, and the estimated leach field contaminant concentrations for PBF-30. All of the contaminants shown on the PBF-30 contaminant worksheet you gave me were evaluated in this analysis.

The risk-based concentrations shown in Table 1 were calculated by rearranging the risk equations presented in reference b to solve for soil concentrations that would produce a risk equal to 1E-06 or a hazard quotient equal to 1.0. The concentrations shown are the minimum concentrations calculated from analysis of five exposure routes (soil ingestion, inhalation of fugitive dust, inhalation of volatiles, ingestion of groundwater, and external radiation exposure) in both an occupational and residential scenario. All parameter values used in these calculations are consistent with the EPA standard default values described in reference a.

The groundwater ingestion risk-based concentrations were calculated with the use of the computer model GWSCREEN (reference b). For the purposes of GWSCREEN modeling, I assumed that the contaminants contained in the PBF-30 storage tank would have contaminated a volume of 10 ft x 10 ft x 10 ft (3.05 m x 3.05 m x 3.05 m), and that the depth to groundwater beneath the storage tank is 139 m. These assumptions are consistent with other Track-1 studies performed at PBF.

As shown in the second column of Table 1, risk-based soil concentrations could not be calculated for all of the contaminants that were detected in the storage tank's sludge. For example, six contaminants (aluminum, calcium, iron, magnesium, potassium, and sodium) are essential nutrients that are considered non-toxic to humans. Four other contaminants (2,4-Dichlorobenzene, cobalt, copper, and vanadium), are currently under review by the EPA, so they do not have the toxicity information needed to calculate risk-based concentrations.

The estimated leach field contaminant concentrations are shown in the fourth column of Table 1. These concentrations were estimated assuming the leach field has a surface area of 1,000 ft^2, contaminants contained in the septic system water were deposited in the top 3 ft of soil after infiltrating into the leach field, a total of 40,000,000 gal of water flushed through the septic system over the 8 years that the system was in use, and the concentrations of contaminants that traveled through the septic system were the same as the maximum concentrations measured during the recent sampling of the septic storage tank water. With these assumptions, the following equation was used to estimate the leach field contaminant concentrations;

$$C_{soil} = C_{water} \times CF$$

where;

C_{soil} = Contaminant soil concentration (mg/kg)

C_{water} = Contaminant water concentration (μg/L)

CF = Conversion factor given by;

$$CF = \frac{4E+07\ gal \times 3.79\ L/gal \times 0.001\ mg/\mu g}{3{,}000\ ft^3 \times (0.305\ m/ft)^3 \times (100\ cm/m)^3 \times 1.5\ g/cm^3 \times 0.001\ kg/g}$$

$$CF = 1.19\ \frac{L - mg}{\mu g - kg}$$

Tables 2 and 3 show the exposure route specific risk-based soil concentrations for an occupational and residential exposure scenario. The concentrations shown in the second column of Table 1 are the minimum concentrations from Tables 2 and 3 for each contaminant.

If you have any questions about these results, please call me at 6-4324.

Table 1. Risk-based soil concentrations for PBF-30.

Contaminant	Risk-Based Soil Concentration (mg/kg or pCi/g)	Maximum Measured Septic System Water Concentration (μg/L or pCi/L)	Estimated Leach Field Concentrations (mg/kg or pCi/g)
Semi-volatiles:			
2,4-Dichlorophenol	NC[a]	Not Detected[c]	Not Calculated
1,4-Dichlorobenzene	1.91E+05	1.50E+05	1.79E+05
Volatiles:			
Methylene Chloride	7.55E+01	4.00E+00	4.76E+00
2 - Butanone	1.36E+05	1.80E+01	2.14E+01
Metals:			
Aluminum	NC[b]	2.79E+03	3.32E+03
Arsenic	4.27E-01	4.90E+00	5.83E+00
Barium	1.89E+04	6.19E+01	7.37E+01
Beryllium	1.49E-01	4.50E-01	5.36E-01
Calcium	NC[b]	1.39E+04	1.65E+04
Chromium	1.35E+03	9.96E+01	1.19E+02
Cobalt	NC[a]	2.06E+01	2.45E+01
Copper	NC[a]	9.45E+01	1.12E+02
Iron	NC[b]	1.42E+05	1.69E+05
Lead	9.53E+04	2.54E+02	3.02E+02
Magnesium	NC[b]	1.93E+03	2.30E+03
Manganese	1.35E+03	6.20E+02	7.38E+02
Nickel	5.40E+03	5.33E+01	6.34E+01

Table 1. Risk-based soil concentrations for PBF-30.

Contaminant	Risk-Based Soil Concentration (mg/kg or pCi/g)	Maximum Measured Septic System Water Concentration (μg/L or pCi/L)	Estimated Leach Field Concentrations (mg/kg or pCi/g)
Potassium	NC[b]	9.86E+02	1.17E+03
Silver	1.35E+03	8.43E+02	1.00E+03
Sodium	NC[b]	2.44E+03	2.90E+03
Vanadium	NC[a]	1.88E+01	2.24E+01
Zinc	8.10E+04	2.81E+02	3.34E+02
PCBs:			
Aroclor 1260	8.31E-02	Not Measured[c]	Not Calculated
Radionuclides:			
Cs-137	8.61E-02	Not Measured[c]	Not Calculated

a. Not calculated due to a lack of available toxicity information.
b. Not calculated because contaminant is an essential nutrient.
c. Contaminant was not detected during site sampling.

Table 2. Occupational exposure scenario risk-based soil concentrations.

	Occupational Scenario											
	Soil Ingestion			Inhalation of Dust			Inhalation of Volatiles		Groundwater Ingestion			External Exposure
Contaminant	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at HQ=1	SC at risk=1E-06	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at 1E-06 radionuclides
1,4-Dichlorobenzene	NA	NA	NA	7.77E+10	NA	NA	2.40E+05	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	1.20E+06	NA	NA	2.77E+10	NA	NA	1.71E+05	NA	NA	NA	NA	NA
Arsenic	6.00E+02	3.80E+00	NA	NA	1.85E+04	NA	NA	NA	NA	NA	NA	NA
Barium	1.40E+05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	1.00E+04	1.33E+00	NA	NA	3.31E+04	NA	NA	NA	NA	NA	NA	NA
Chromium	1.00E+04	NA	NA	NA	6.61E+03	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	1.00E+04	NA	NA	4.86E+06	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	1.20E+05	7.60E+02	NA	NA	1.69E+08	NA	NA	1.18E+02	NA	NA	NA	NA
Nickel	4.00E+04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB	1.40E+02	7.40E-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	1.00E+04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	6.00E+05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cs-137	NA	NA	1.01E+02	NA	NA	3.63E+04	NA	NA	NA	NA	NA	8.61E-02

Table 2. Residential exposure scenario risk-based soil concentrations.

	Residential Scenario												
	Soil Ingestion			Inhalation of Dust			Inhalation of Volatiles		Groundwater Ingestion			External Exposure	Min SC
Contaminant	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at HQ=1	SC at risk=1E-06	SC at HQ=1	SC at risk=1E-06	SC at 1E-06 radionuclides	SC at 1E-06 radionuclides	SC (mg/kg or pCi/g))
1,4-Dichlorobenzene	NA	NA	NA	5.64E+10	NA	NA	1.91E+05	NA	NA	NA	NA	NA	1.91E+05
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	1.62E+05	NA	NA	2.01E+10	NA	NA	1.36E+05	NA	2.54E+05	NA	NA	NA	1.36E+05
Arsenic	8.10E+01	4.27E-01	NA	NA	1.08E+04	NA	NA	NA	5.29E+02	2.75E+00	NA	NA	4.27E-01
Barium	1.89E+04	NA	NA	NA	NA	NA	NA	NA	2.26E+06	NA	NA	NA	1.89E+04
Beryllium	1.35[illegible]	1.49E-01	NA	NA	1.94E+04	NA	NA	NA	7.80E+05	8.47E+01	NA	NA	1.49E-01
Chromium	1.35E+03	NA	NA	NA	3.87E+03	NA	NA	NA	4.52E+03	NA	NA	NA	1.35E+03
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	9.53E+04	NA	NA	NA	9.53E+04
Manganese	1.35E+03	NA	NA	3.52E+06	NA	NA	NA	NA	1.61E+05	NA	NA	NA	1.35E+03
Methylene Chloride	1.62E+04	8.53E+01	NA	NA	9.88E+07	NA	NA	7.55E+01	2.54E+04	1.32E+02	NA	NA	7.55E+01
Nickel	5.40E+03	NA	NA	NA	NA	NA	NA	NA	1.27E+06	NA	NA	NA	5.40E+03
PCB	1.89E+01	8.31E-02	NA	NA	NA	NA	NA	NA	5.65E+03	2.44E+01	NA	NA	8.31E-02
Silver	1.35E+03	NA	NA	NA	NA	NA	NA	NA	2.88E+05	NA	NA	NA	1.35E+03
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	8.10E+04	NA	NA	NA	NA	NA	NA	NA	2.68E+06	NA	NA	NA	8.10E+04
Cs-137	NA	NA	2.50E+01	NA	NA	2.18E+04	NA	NA	NA	NA	9.34E+219	1.67E-02	8.61E-02